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PREVENTING GREENBUG OUTBREAKS



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U. S. DEPARTMENT OF AGRICULTURE

PREVENTING GREENBUG OUTBREAKS¹

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THE GREENBUG,² sometimes called the spring grain aphid, is a pest of small grains in the Central and Southeastern States. It causes some damage every year, and several severe outbreaks have occurred.

In the spring of 1950 the insect caused severe injury to barley, oats, and wheat in northern Texas, western Oklahoma, and in some parts of Colorado, Kansas, and Nebraska. More than 1,500,000 acres of these small grains were abandoned because of the infestation, and the yield on many other acres was greatly reduced. Insecticides were applied to more than 600,000 acres. In addition to the grain destroyed, the losses included local seed stocks with consequent need for shipping in new seed for planting, as well as the value of winter pasture to stockmen. In the previous year there was severe damage in the Great Plains from Nebraska into southern Canada.

This insect has also appeared in outbreak numbers as far east as North Carolina. Since 1882, when it was first reported in the United States from Virginia, there have been 14 outbreaks. The most serious one occurred in 1942, when in Texas and Oklahoma more than 61 million bushels of grain, valued at 38 million dollars, were lost.

INJURY CAUSED BY THE GREENBUG

The greenbug sucks the sap from the grain plants, causing the leaves to turn yellow. In heavy infestations the leaves soon wither and the plants die, whereupon the insects move to new plants.

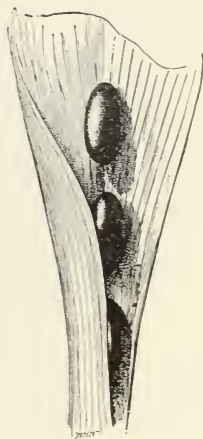
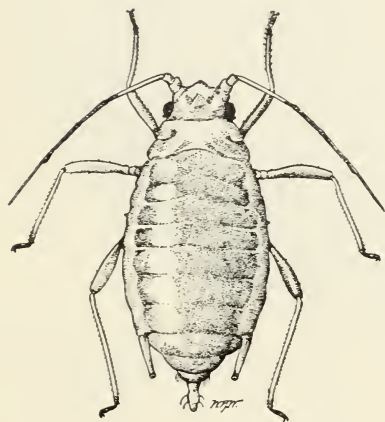
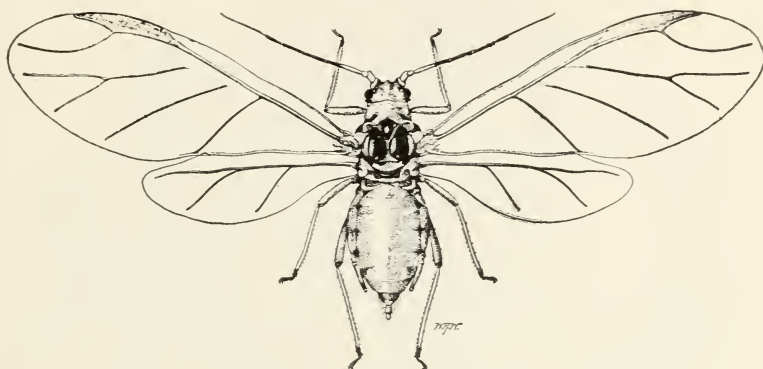
In the winter-wheat belt greenbug injury may be noticed first in the fall or winter, when spots of dead plants a few feet in diameter appear in the field. On close examination distinct degrees of injury are evident. Surrounding an area of dead plants are still living but heavily infested and badly damaged plants, which have lost most of their green color. Beyond them on all sides are plants showing less damage. As the infestation spreads these spots become larger, and several may join together so that large portions of a field are affected. Sometimes these spots do not appear, but entire fields of fall-planted grain become infested with swarms of migrating greenbugs.

¹ This leaflet supersedes Farmers' Bulletin 1217, The Green-Bug or Spring Grain-Aphis.

² *Toxoptera graminum* (Rond.).

SEASONAL HISTORY

Both wingless and winged forms of the greenbug occur. All the wingless forms are females, and they give birth to living young. In the Southern States, except in high altitudes, they reproduce continuously throughout the year. Farther north on the approach of cold weather winged males and females are produced, and after mating these females lay eggs. The shiny black eggs overwinter on the leaves of the plants on which they were laid, and early in the spring they hatch into wingless females.



Winged and wingless forms of the adult greenbug, and greenbug eggs deposited on a leaf. Greatly enlarged. (Webster and Phillips)

When newly hatched, greenbugs are pale green, and when full grown they have a dark green stripe down the back. From 6 to 30 days after hatching, according to the temperature, these females give birth to living young, both winged and wingless forms, and they continue to reproduce for 20 to 30 days, each female producing 50 to 60 progeny. In this way reproduction continues. In Indiana there may be 20 generations a year, and even more in Texas and Oklahoma.

NATURAL CONTROL

With this rapid rate of reproduction, in a single season enough greenbugs could develop to destroy all the plants on which they feed, if their numbers were not kept down by natural enemies and unfavorable weather.

All serious outbreaks of this insect have occurred when the previous summer was cool and moist, followed by a mild winter and cool, late



Greenbugs killed by a parasitic wasp. The light-colored bugs have been parasitized; the dark ones are still living. (Fenton and Whitehead)

spring. Greenbugs can reproduce and develop at temperatures from 40° to 100° F., but do so most rapidly between 55° and 65°. When the temperature goes as low as 5° or as high as 107° some may be killed.

Populations may also be held in check by a small wasp, *Aphidius testaceipes* (Cress.), which is usually present where greenbugs are abundant. This wasp lays its eggs in the greenbug's body, and the maggots hatching from the eggs eat out the body and emerge as adults through holes that they cut in the host shell. These wasps reproduce much more slowly than the greenbugs when the temperature is below

65° F., so that during long periods of cool weather the greenbug is able to increase to enormous numbers without much interference from them. This relationship between the two insects is apparently responsible for greenbug outbreaks in years in which a cool spring follows a mild winter.

Large numbers of lady beetles are also frequently found in fields heavily infested with greenbugs. Both adults and larvae of these predators feed on the greenbugs and in some years may aid materially in controlling them.



Pupae of the convergent lady beetle, another greenbug enemy. (Bieberdorf)

CULTURAL CONTROL

In the southern part of its range the greenbug depends on volunteer grain for its existence from the time the grain is cut until the next crop is above ground. Therefore, one of the most important control measures is to destroy all these volunteer grains by disking, plowing, clean fallowing, and such other cultural measures that will not cause soil erosion. Preventing the growth of volunteer small grains is especially important in Texas and Oklahoma, where serious outbreaks may originate and sweep northward.

Cultural measures that will stimulate the growth of the plants and enable them to withstand greenbug damage include the use of good seed of recommended varieties, careful preparation of seedbeds, regulation of soil moisture, crop rotation, and use of sufficient fertilizer. Fall-sown barley, oats, and wheat are usually injured more severely when they follow grain sorghums in rotation than when they follow soybeans, corn, or wheat. Small grains rotated with legumes are injured less than continuous plantings. Fall-sown oats has produced a fair crop in areas where spring-sown oats was completely destroyed by greenbugs.



Field of winter oats showing greenbug injury.

CONTROL WITH INSECTICIDES

When natural or cultural control is inadequate, insecticides can be used to suppress greenbug outbreaks. Early in the spring, when the plants are small and there are few parasites or predators, an insecticide should be applied as soon as any injury is noted. Parathion and certain other phosphorus-containing insecticides are the most effective for this purpose. Later in the season the natural enemies may control even a heavy infestation in a few days, so that no insecticide is needed.

Parathion

During the greenbug outbreaks in 1949 and 1950 parathion sprays and dusts gave excellent control. Wettable powders containing 15 or 25 percent and emulsifiable concentrates containing 16, 25, or 38 percent of parathion are available for use as sprays after they have been diluted with water to the desired strength. They should be prepared and handled according to the directions on the container.

Products for application as dusts usually contain 1, 1.5, or 2 percent of parathion.

Parathion should be applied only with power equipment. **It is an extremely poisonous material, and the use of hand dusters or sprayers would be too hazardous to the operator.** Applications can be made by airplane or with ground equipment. A wettable powder should be used only with high-pressure and mist sprayers, where continuous mechanical agitation is maintained. Gear-type pumps are not satisfactory, because the powder has an abrasive action on them.

Both sprays and dusts should be applied at the rate of 4 ounces of parathion per acre. To obtain this dosage with a spray, the following quantities of commercial preparation should be used:

| <i>Percent</i> | <i>Pounds Ounces</i> | |
|----------------|----------------------|-----|
| 15----- | 1 | 11 |
| 16----- | 1 | 9 |
| 25----- | 1 | 0 |
| 38----- | | 10½ |

Sprays made with a wettable powder require at least 5 gallons of water per acre. Emulsions can be prepared with as little as 1½ to 2 gallons of water per acre for application by airplane, but at least 8 gallons are necessary for use in ground sprayers.

Parathion dusts are just as effective as sprays when the weather is calm so that there is no drifting. A 1-percent dust should be applied at the rate of 25 pounds, a 1.5-percent dust at 17 pounds, and a 2-percent dust at 12½ pounds per acre.

For best results with either sprays or dusts the temperature should be 50° F. or above at the time of the treatment and for at least 3 hours thereafter.

Other Insecticides

A mixture of parathion and the dimethyl homolog of parathion, sold as an emulsifiable concentrate under the trade name Metacide, has also given good control of greenbugs. For application by airplane 12 ounces of the 33-percent concentrate in 2 gallons of water per acre should be used, and for spraying from the ground 12 ounces of the same concentrate in 8 to 15 gallons of water, depending on the type of sprayer.

Tetraethyl pyrophosphate insecticide will also give satisfactory control when the temperature is 75° F. or above. A dosage of 4 to 5 ounces of the active ingredient per acre is recommended.

PRECAUTIONS

All these insecticides are highly toxic to man and livestock. Although they vary somewhat in their toxicity, they must all be handled with the same great care, and only by persons experienced in handling and applying poisonous chemicals. All precautions printed on the containers should be strictly observed.

These insecticides must not be inhaled or allowed to come in contact with the skin. Operators exposed to dusts or sprays containing parathion should wear half-masks equipped with cartridges of a type passed by the United States Department of Agriculture, supplemented

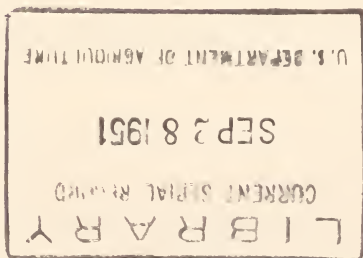
with aerosol filters. When these masks are in continuous use, the cartridges should be changed every 8 hours and the filters whenever breathing through them becomes difficult.

Clothing on which any poison is spilled should be removed immediately and washed with soap and water. If the insecticide comes in contact with the skin, it should be washed off at once with soap and water.

If a person has headache or nausea, the pupils of his eyes become contracted, or he shows any other signs of illness from handling these insecticides, he should be taken to a doctor at once. The doctor should be told that the most effective antidote for parathion is repeated treatment with atropine to the limit of the patient's tolerance.

All containers should be burned, decontaminated with alkali, or otherwise treated so that they cannot be used again. Any spillage should be decontaminated with alkali.

Animals should not be pastured in grain fields for 2 weeks after they have been treated with parathion or Metacide. Tetraethyl pyrophosphate residues disappear more quickly and fields treated with this insecticide can be used as pasture after 3 days.



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